Ontario

Ministry of Transportation

Highway 7&8 Transportation Corridor Planning and Class EA Study

Greater Stratford to New Hamburg Area

MTO Group Work Project # 13-00-00

Report J: Milestone Report - Selection of Preliminary Design Alternatives for Provincial Roadways

DRAFT

July, 2013

www.7and8corridorstudy.ca

This report is presented in draft format in order to obtain information and comments from stakeholders. Your input is requested by October 31, 2013 so the report can be finalized.

AECOM

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Table of Contents

List of Exhibits:

Appendices

1.0 INTRODUCTION

1.1 Introduction to the Highway 7&8 Transportation Corridor Planning and Class EA Study

The Ministry of Transportation (MTO) is undertaking a Highway 7&8 Transportation Corridor Planning and Class Environmental Assessment (Class EA) Study, from Greater Stratford to the New Hamburg area. The study includes:

- development of a plan that is a long-term strategy to address:
  - capacity, operation and safety needs along the 2-lane and 4-lane sections of Highway 7&8 between Stratford and the New Hamburg area and through the urban centres (Stratford, Shakespeare and New Hamburg) along Highway 7&8 for the movement of people and goods; and
  - linkage needs between the analysis area and transportation corridors serving other regions in the province.
- preparation of a Preliminary Design for the provincial highway components of that plan; and
- documentation of the work in a Transportation Environmental Study Report for public review at study completion.

This study also:

- involved reviewing and building on the findings of the MTO Highway 7&8 Study Design – Greater Stratford to New Hamburg Area, December 2005;
- addresses the transportation policies and growth forecasts of the final Growth Plan for the Greater Golden Horseshoe (recognizing that the easterly portion of the analysis area for this project lies within the Greater Golden Horseshoe); and
- recognizes other relevant transportation corridor studies being undertaken by MTO.

Access to the above documents can be obtained through the project website at www.7and8corridorstudy.ca.

The study is being carried out as a Group 'A' project which is , in accordance with the Class Environmental Assessment for Provincial Transportation Facilities.

A major component of the study is an outreach and consultation program structured around six key points of decision-making, each of which is supported by:

- the release of a newsletter;
- the release of draft reports for review and comment;
- a round of Public Information Centres (PICs);
- posting of information on the study website; and
- newspaper notices announcing the above.

At the completion of the study, the filing of a Transportation Environmental Study Report (TESR) will be announced through newspaper notices. Decisions on funding and timing of detail design and construction are based upon environmental clearance of the TESR, since it determines the type of transportation facility its location, and triggers for its implementation.

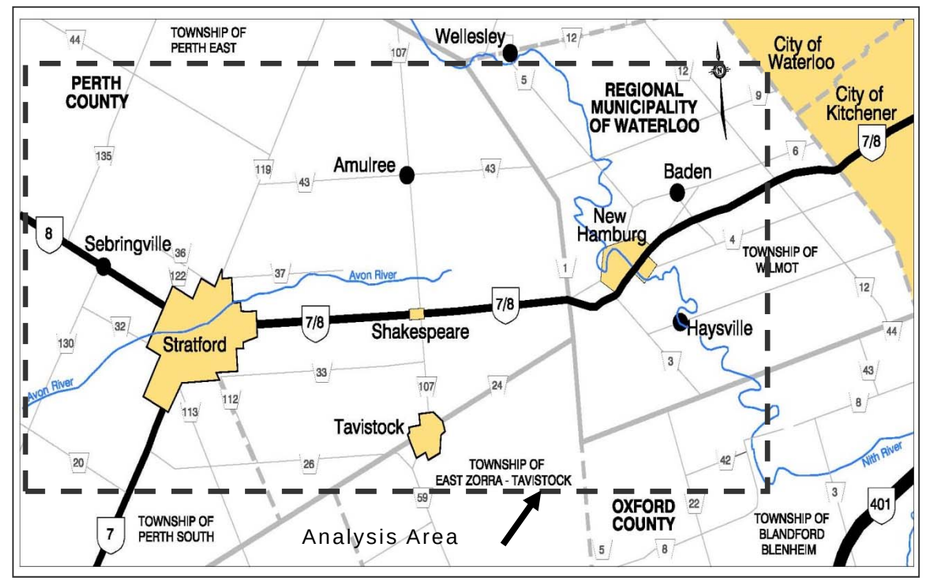
1.2 Study Background

1.2.1 Area Transportation System Strategy

The Analysis Area was established to identify transportation problems and opportunities associated with Highway 7&8 from the Greater Stratford to New Hamburg Area plus the broader 'Area Transportation System' (including Highway 8) between Highway 7&8 and Highway 401. The Analysis Area was not intended to represent a Study Area for the planning alternatives to be generated during the course of the study. The selection of a Study Area within the Analysis Area is documented in Report E.

For orientation and reference, a map of the Analysis Area is provided in **Exhibit 1.1** below.

Exhibit 1.1: Map of Analysis Area



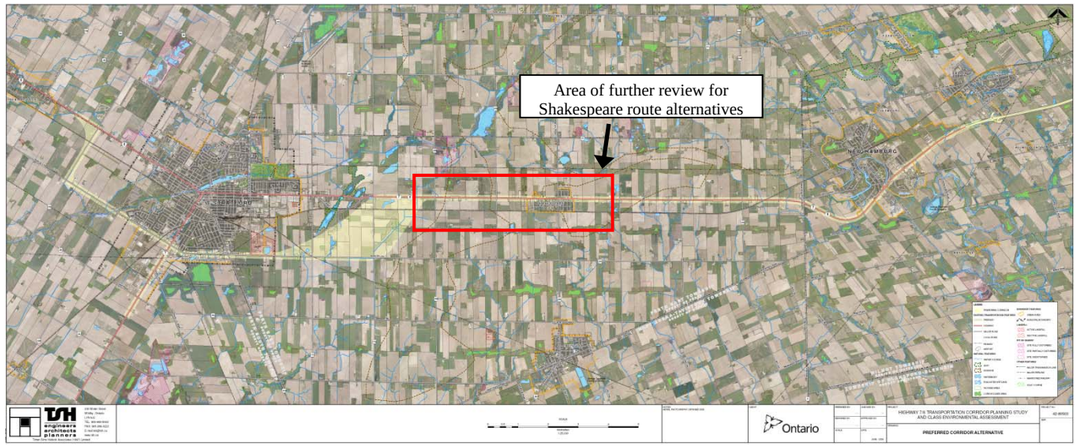
The detailed transportation assessment (detailed in Report C) determined that from Stratford to New Hamburg there will be a road capacity deficiency in the area road network (includes provincial and municipal roadways) of one lane in both the east and west directions by 2031 and that the required additional lanes should be on a single 4-lane provincial highway to improve mobility and safety. West of Stratford there is not a capacity deficiency, but there is a need to link the provincial highway system and an opportunity to include safety enhancements. Accordingly, the study is investigating 2-lane alternatives west of Stratford.

The 2031 forecasted traffic volumes have assumed that all reasonable modes of travel and demand management such as ridesharing, telecommuting, optimizing passenger/ freight rail capacity and increased inter-regional transit services are already implemented and operating to their fullest potential.

The area transportation needs assessment (detailed in Report D) identified the preferred highway corridor improvements (i.e. widening of existing Highway 7&8 or a new highway corridor or combinations of the foregoing, plus inter-regional transit and transportation demand management (e.g. ridesharing and telecommuting)) to address the area transportation system problems and opportunities.

A preferred highway corridor and an associated Study Area for the generation of detailed planning (route) alternatives, including an area for further review of Shakespeare route alternatives, was defined and is documented in Reports G and H. The Study Area for the generation of route alternatives is shown below in **Exhibit 1.2**.

Exhibit 1.2: Map of Study Area for the Generation of Route Alternatives



1.2.2 Generation and Evaluation of Detailed Planning (Route) Alternatives

The Study Area was then divided into six sections for the generation of provincial highway detailed planning (route) alternatives. These alternatives were reviewed with stakeholders, agencies and the public through the PIC #3B consultation process, with modifications / refinements made to the alternatives where appropriate to generate a final set of detailed planning (route) alternatives to be evaluated.

The environmental and transportation factors, sub-factors, criteria and indicators considered for the assessment and evaluation of route alternatives (presented in Report H) were refined / modified in part based on local information provided by stakeholders through the consultation process and then used to determine a preferred route alternative. Two evaluation approaches were used to assist in the selection of a preferred route alternative. The Reasoned Argument (or Trade-off) method was the primary tool used to identify a preferred alternative. The Arithmetic (weighting-scoring) method was the secondary tool, used to validate the results of the reasoned argument method. The preferred route alternative was presented for public review and comment at PIC #4 and was confirmed as the selected route in Spring 2011.

The assessment and evaluation results for the route alternatives resulted in the selection of a south bypass of Shakespeare with:

- 4-lane alternatives on a single facility using sections of existing highway and new highway route from New Hamburg to Stratford; and
- 2-lane alternatives west of Stratford to link back to the provincial highway system.

This is documented in Report H and the preferred south bypass route for the entire study area is presented in **Exhibit 1.3**.

1.2.3 Generation of Preliminary Design Alternatives

Preliminary Design involves defining the selected route in greater detail, including:

- Horizontal and vertical alignments
- Highway cross section
- Crossing road intersection treatments (interchanges; grade separations; signalized and unsignalized intersections; 1-lane and 2-lane roundabouts)
- Right-of-way width / property requirements
- Drainage requirements (watercourse crossings, municipal drainage / tile drainage modifications, and a preliminary stormwater management strategy)
- Highway lighting requirements
- Access management (number and location of intersections and private entrances)
- Mitigation measures (e.g. environmental protection/mitigation)

Preliminary Design Alternatives are generated when more than one method of implementing the proposed improvements is available with the objectives of capitalizing on transportation engineering opportunities, avoiding significant environmental features and / or minimizing design related environmental impacts.

In recognition of the varied environment and transportation requirements along the selected route, the study area was divided into eight segments for the development of Preliminary Design Alternatives, as shown in **Exhibit 1.4**. A range of Preliminary Design Alternatives for the highway cross section and crossing road intersection treatments was generated and presented in Report I and at PIC #5 for public review and comment.

In response to municipal stakeholder input during the PIC #4 consultation process, the study team examined in greater detail the route alternative that uses existing Highway 7&8 west of Shakespeare via a north bypass of Shakespeare, and a segment of Road 110 as the linkage from existing Highway 7&8 to Lorne Avenue. To accomplish this, Preliminary Design Alternatives for the north bypass route were generated and presented as Preliminary Design Alternatives to be collectively evaluated with Preliminary Design Alternatives for the previously selected south bypass route, at the same level of detail.

In response to stakeholder input during the PIC #5 consultation process and based on additional analysis and development of the design alternatives by the study team, some refinements to the Preliminary Design Alternatives presented at PIC #5 were made in Segments A, D, E, F and H. These refinements and the rationale for the adjustments are documented in Section 2.0 of this report.

Exhibit 1.3: Map of Preferred Route Alternative

Section 1: West of Highway 7 / Erie Street	Section 2: Lorne Avenue to East of Stratford	Section 3: East of Stratford to East of Perth Line 109	Section 4: Shakespeare Area, East of Perth Line 109 to East of Road 106	Section 5: East of Road 106 to East of Regional Road 1	Section 6: East of Regional Road 1 to East of Nafziger Road
Existing Hwy 8, Perth Road 125, Lorne Avenue, Erie Street alignments	Existing Lorne Avenue alignment	Perth Road 33 to west of Road 110, new alignment on east side of Central municipal drain to south side of railway corridor	New alignment on south side of railway corridor to east of Shakespeare connecting to existing Highway 7&8 west of Road 106	Existing Highway 7&8 alignment	Existing Highway 7&8 alignment

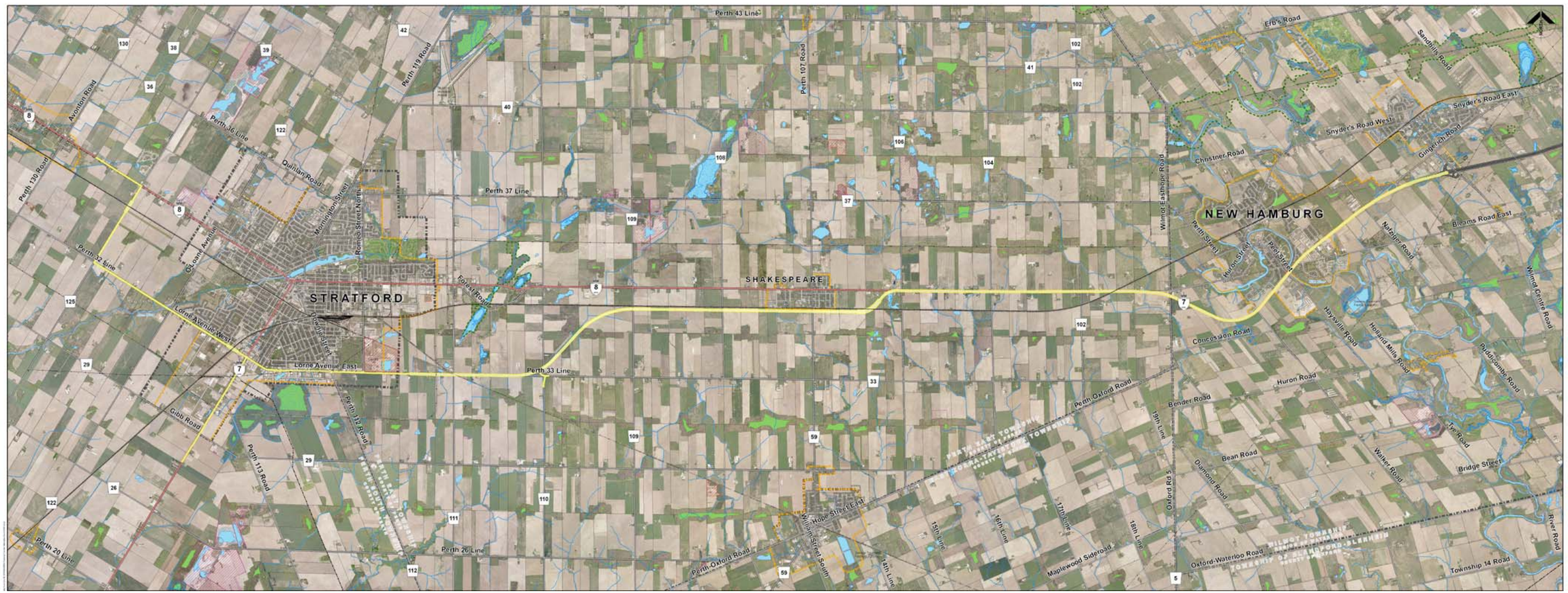
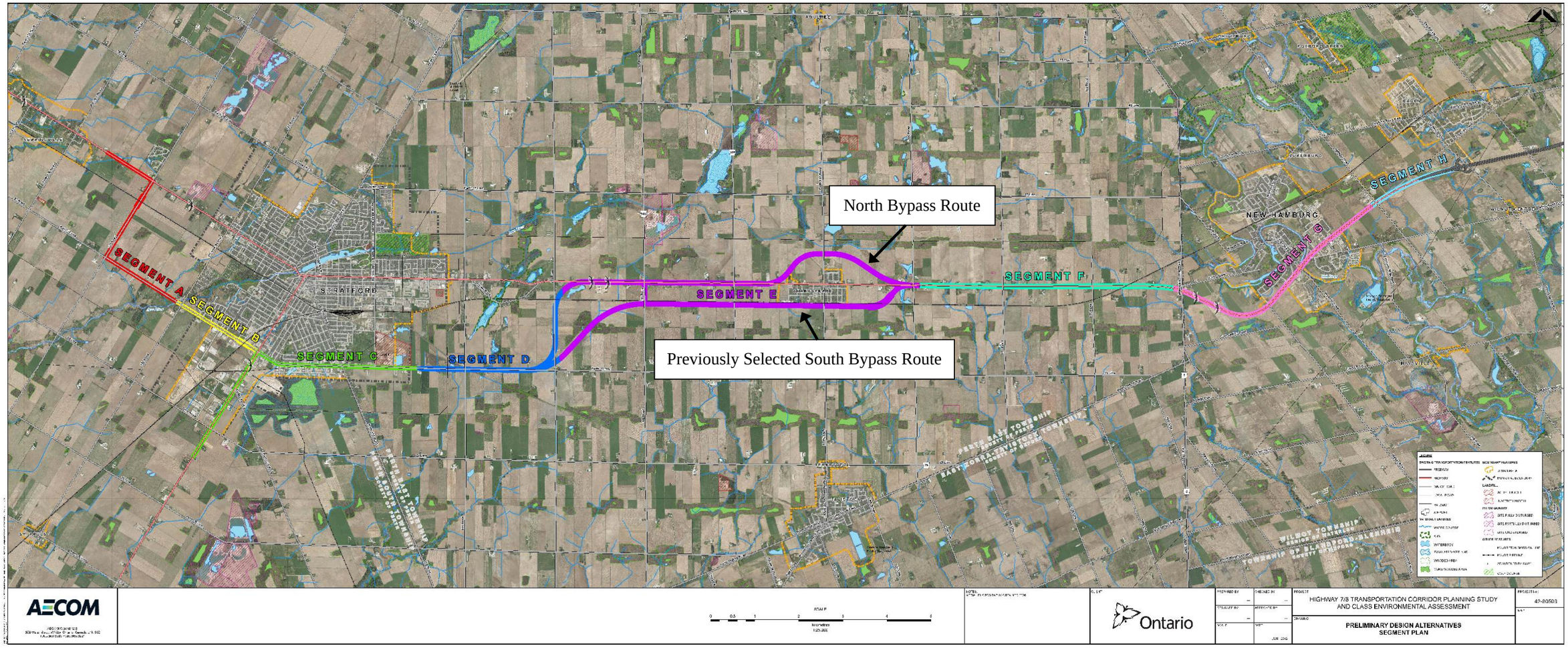


Exhibit 1.4: Preliminary Design Segments

Segment A	Segment B	Segment C	Segment D	Segment E	Segment F	Segment G	Segment H
West of Road 125 to West Limit of Stratford	West Limit of Stratford to West of Erie Street	West of Erie Street to East of East Limit of Stratford, including Erie Street	East of East Limit of Stratford to East of Road 110	East of Road 110 to East of Road 106	East of Road 106 to West of RR1	West of RR1 to West of Nafziger Road	West of Nafziger Road to East of Nafziger Road



1.3 Purpose, Relevance and Position of Report "J" Within the Study Process

The purpose of Report J is to document the process for the evaluation of Preliminary Design Alternatives, including highway cross section and crossing road intersection treatments and the identification of a preferred Preliminary Design for the entire study area.

As can be seen in **Exhibit 1.5** below, Report J is the eleventh of 12 reports to be prepared for this study and the second report of Phase 5, Preliminary Design. Work completed as part of Study Phases 1 through 4 is available in Reports A through H and the work completed to initiate Preliminary Design is available in Report I.

Exhibit 1.5: Summary of Reports Highway 7&8 Transportation Corridor Planning and Class EA Study
STUDY PHASE 1: STUDY PLAN
• Report "A" Study Plan For Technical Work, Outreach And Consultation
STUDY PHASE 2: AREA TRANSPORTATION SYSTEM PLANNING
• Report "B": Working Paper – Overview of Transportation, Land Use and Economic Conditions Within the Analysis Area
• Report "F" -1st Part: Working Paper - Environmental Conditions And Constraints
• Report "C": Working Paper – 'Area Transportation System' Problems and Opportunities
• Report "D": Working Paper – Area Transportation System Alternatives
STUDY PHASE 3: PRELIMINARY PLANNING
• Report "E": Milestone Report – Highway 7&8 Transportation Corridor Needs Assessment
STUDY PHASE 4: DETAILED PLANNING FOR PROVINCIAL ROADWAYS
• Report "F" 2nd Part: Working Paper - Environmental Conditions And Constraints
• Report "G": Working Paper – Generation of Detailed Planning Alternatives for Provincial Roadways
• Report "H": Milestone Report - Selection of Detailed Planning Alternatives for Provincial Roadways
STUDY PHASE 5: PRELIMINARY DESIGN FOR PROVINCIAL ROADWAYS
• Report "I": Working Paper - Generation of Preliminary Design Alternatives for Provincial Roadways
• ***Report "J": Milestone Report - Selection of Preliminary Design Alternatives for Provincial Roadways***
STUDY PHASE 6: TRANSPORTATION ENVIRONMENTAL STUDY REPORT
• Report "K": Transportation Environmental Study Report (documents overall study)

2.0 EVALUATION OF PRELIMINARY DESIGN ALTERNATIVES

2.1 Environmental Conditions and Constraints

The existing environmental conditions and constraints in the Study Area are documented primarily in Report F (Part 1) and Report F (Part 2): Working Papers - Environmental Conditions and Constraints (June, 2008 and July, 2009 respectively). Report F, Part 1 provides an environmental overview within the Analysis Area (**Exhibit 1.1**) based on secondary source information and was completed in June 2008. Report F, Part 2 documents the field investigations undertaken in the Study Area for the preferred highway corridor (**Exhibit 1.2**) and was completed in July 2009. The information presented in Report F Parts 1 and 2 was obtained from a variety of sources including:

- Agriculture and Agri-Food Canada
- Natural Resources Canada
- Ministry of Agriculture, Foods and Rural Affairs
- Ministry of Natural Resources
- Ministry of Environment
- Ministry of Tourism, Culture and Sport
- Grand River Conservation Authority
- Upper Thames River Conservation Authority
- County of Perth Official Plan policies
- County of Oxford Official Plan policies
- Region of Waterloo Official Plan policies
- City of Stratford Official Plan policies

In addition, the environmental conditions and constraints used in the development and evaluation of Preliminary Design Alternatives rely on information provided by:

- Specialist fieldwork and investigations, documented in associated reporting and mapping
- Consultation with local groups and historical societies
- Local stakeholder submissions over the course of the study and in particular through consultation events such as the PICs and workshops
- Agricultural input received through consultation exercises

A detailed description of the environment potentially affected by the preferred Preliminary Design (the Recommended Design) for the highway was prepared based on discipline-specific field investigations undertaken as part of the generation and selection of detailed planning alternatives. Additional field investigations were also carried out as part of the detailed impact assessment for the Recommended Design to reconfirm and augment data collected during the previous phases of the study. Summary mapping of the environmental conditions and constraints identified from all of these sources is provided in **Appendices A** through **G**.

The mapping of environmental considerations in **Appendices A** through **G** is presented for the preferred Preliminary Design alternative for each segment on the larger plans within these appendices. The right-of-way requirements remained constant, regardless of the cross section alternatives for each segment, therefore there were no discernible differences in potential impacts to the environment as a result of the cross section alternatives. The detailed mapping developed to identify the difference in potential impacts between the Preliminary Design alternatives therefore focuses on the alternative crossing road intersection treatments.

2.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of the Preferred Preliminary Design

The evaluation of highway cross section and crossing road intersection treatment alternatives was conducted on a segment by segment basis using the “reasoned argument approach” as this approach best identifies the trade offs between the various evaluation factors, sub-factors, criteria and indicators.

The approach for evaluating Preliminary Design Alternatives was completed in the same manner as the evaluation of route alternatives (detailed planning alternatives) documented in Report H. Recognizing that the preferred alternative east of Stratford is in part dependent upon the preferred alternative for the Shakespeare area, Segments D and E, which encompass the Shakespeare area and the connection alternatives east of Stratford, were combined and the north and south bypass alternatives were comparatively evaluated.

The evaluation of north and south bypass Preliminary Design Alternatives for Segments D and E was completed in steps as follows:

- North bypass alternatives evaluated to identify a preferred north Preliminary Design alternative
- South bypass alternatives evaluated to identify a preferred south Preliminary Design alternative
- Preferred north and south Preliminary Design Alternatives evaluated to identify a preferred Preliminary Design alternative for the Shakespeare area and the area east of Stratford

The list of evaluation factors, sub-factors, criteria and indicators is presented in **Exhibit 2.1**.

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
1. Natural Environmental Factors		
1.1 Fisheries and Aquatic Ecosystems	1.1.1 Fish Habitat	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • critical fish habitat features • riparian areas • habitat rehabilitation goals
	1.1.2 Fish Community	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/ disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • fish species at risk (vulnerable, threatened or endangered fish species) • fish movement/migration • critical fish life stage processes (spawning, rearing, nursery, feeding) • long-term fish community management goals
1.2 Terrestrial Ecosystems	1.2.1 Wildlife	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • wildlife species at risk (vulnerable, threatened or endangered wildlife species) • wildlife of local and regional importance • migratory birds • critical wildlife habitat features • ecologically functional areas such as connective corridors or travel ways for movement/migration • important wildlife areas such as deeryards, heronries, waterfowl areas, important bird areas • wildlife management, rehabilitation/research program sites • interference with critical wildlife life stage processes (eg mating/rearing) etc
	1.2.2 Wetlands	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • provincially significant wetlands, their buffer areas, and their wetland function • evaluated and un-evaluated wetlands, their wetland buffer areas, and their wetland function • wetland management, research and/or wetland conservation programs/areas
	1.2.3 Forests (e.g. woodlands [forest stands, woodlots and interior forest habitat] and significant valley lands [valley and stream corridors])	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • significant woodlands/valley lands • forest management/research program areas

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
	1.2.4 Vegetation Species at Risk	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/disruption • short-term alteration/disruption (construction impacts). as applicable to the following: • populations of vegetation species at risk (vulnerable, threatened or endangered species), species of conservation concern and significant regional/local flora/communities • areas/corridors supporting known populations of vegetation species at risk (vulnerable, threatened or endangered species), species of conservation concern and significant flora/communities • vegetation management, rehabilitation/research program sites
	1.2.5 Designated/Special Areas (such as world biosphere reserves, heritage rivers, ESAs, ESPAs, ANSIs, environmental plan areas, conservation reserves; and the designated special areas of national parks, provincial parks, conservation areas, etc)	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/ disruption; • short-term alteration/disruption (construction impacts) • change in area character/ aesthetics; • nuisance impacts; • change to access / travel time; • change to facilities / utilities / services. to designated/special areas.
1.3 Groundwater	1.3.1 Areas of Groundwater Recharge and Discharge	Potential and significance of alteration to areas of groundwater recharge and discharge due to physical intrusion or groundwater interception, draw-down, impoundment, obstruction, or soil compaction impacting groundwater base-flow and quality
	1.3.2 Groundwater Source Areas and Wellhead Protection Areas	Potential and significance of alteration to large volume wells due to physical intrusion or groundwater interception, draw-down, impoundment, obstruction and by soil compaction
	1.3.3 Large Volume Wells	Potential and significance of alteration to private well use due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction
	1.3.4 Private Wells	Potential and significance of alteration to private well use due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction
	1.3.5 Groundwater-Sensitive Ecosystems (e.g. groundwater fed wetlands, coldwater streams)	Potential and significance of alteration to groundwater-sensitive ecosystems due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction
1.4 Surface Water	1.4.1 Watershed / Sub-Watershed Drainage Features/Patterns	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/ disruption. as applicable to the following: • watercourse crossings (permanent, intermittent and ephemeral) • floodplain or meander belts • riparian areas • sensitive headwater areas • watershed and subwatershed management plans
	1.4.2 Surface Water Quality and Quantity	Potential and significance of impacts on quality through direct and indirect discharges of contaminated and sediment-laden run-off Potential and significance of impacts on hydrology due to changes in ground permeability, modifications to surface drainage patterns and alterations of water bodies
2. Land Use / Socio-Economic Environmental Factors		
2.1 Land Use Planning Policies, Goals, Objectives	2.1.1 First Nations Land Claims	Potential and significance of encroachment, severance, displacement to areas for which there are First Nations outstanding land claims
	2.1.2 Provincial/Federal land use planning policies/goals/objectives NOTES: PPS Policy 1.6.6.4 stipulates that when planning for corridors for significant transportation facilities, consideration will be given to significant natural heritage, water, agricultural, mineral, cultural heritage and archaeological resources. PPS Policy 2.3 requires prime agricultural areas be protected for long-term use. Prime agricultural areas include specialty crop areas and Classes 1, 2, and 3 soils in this order of priority.	Previously addressed through the detailed planning phase.

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
	2.1.3 Municipal (regional and local) land use planning policies/ goals/objectives (Official Plans)	Previously addressed through the detailed planning phase.
	2.1.4 Development Objectives of Private Property Owners	Previously addressed through the detailed planning phase.
2.2 Land Use / Community	2.2.1 First Nation Reserves	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts. to First Nation Reserves
	2.2.2 First Nations' Sacred Grounds	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts. to First Nations' sacred grounds
	2.2.3 Urban and Rural Residential	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption (e.g. loss of parking area); • short-term alteration/disruption (construction impacts); • change in area character / aesthetics (e.g. loss of trees / garden area); • nuisance impacts (e.g. intrusion of highway into current residential envelope); • change to facilities / utilities / services; • interference with residential community cohesion; • change to highway operational impacts (e.g. snow storage and highway access visibility). to urban and rural residential areas (residents [owners/tenants] and community groups).
	2.2.4 Commercial/Industrial	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts; • change to facilities / utilities / services; • interference with residential community cohesion; • change to highway operational impacts (e.g. customer parking, cargo loading/off-loading) to commercial and industrial areas (business owners/tenants and customers).
	2.2.5 Tourist Areas and Attractions (e.g. museums, theatres, etc.)	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts; • change to facilities / utilities / services; • loss of "critical mass" in number of signature business attractions (e.g. number of antique shops). to tourist areas and attractions.

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
	2.2.6 Community Facilities / Institutions (e.g. hospitals, schools, places of worship, unique community features, , municipal parks, public spaces, golf courses, trails, greenways and open space linkages)	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character/ aesthetics; • nuisance impacts; • change to facilities / utilities / services; • change to ease and safety of pedestrian movements across the highway and within the highway right-of-way; • change to highway operation impacts to current use (e.g. highway noise and vibration interfering with church services). to community facilities and institutions.
	2.2.7 Municipal Infrastructure and Public Service Facilities (e.g. sewage and water services, police/emergency services, local utilities)	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change to facilities / utilities / services. to municipal infrastructure and public service facilities.
	2.2.8 Downtown Historic Crossroads Function	Potential and significance of interference by long-distance through traffic on: • “main street” function and structure; • Character / aesthetics; • short-term alteration/disruption (construction impacts); • change to ease and safety of pedestrian movements across the highway and within the highway right-of-way; • change to on-street parking. in the historic downtown area.
	2.2.9 Out of Way Travel for Access to / from local land uses	Potential and significance of: • change to access / travel time to local land uses.
2.3 Noise Sensitive Areas (NSAs) (residential areas and sensitive institutional uses)	2.3.1 Highway Noise	Potential for increase of traffic noise in NSAs by 5 dBA, or to above a 45 dBA ambient within 10 years of project construction.
	2.3.2 Construction Noise	Potential and significance of increase in construction noise to NSAs.
2.4 Agriculture	2.4.1 Agriculture - Canada Land Inventory Class 1,2,3 Land	Potential and significance of encroachment, severance of Canada Land Inventory Class 1, 2 and 3 soils
	2.4.2 Agricultural - Farm Infrastructure	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • nuisance impacts; to farm infrastructure (field tile drainage systems/outlets, irrigation systems, barns / silos/ structures, etc.
	2.4.3 Agriculture – Operations on Individual Farms	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/ disruption; • short-term alteration/disruption (construction impacts); • nuisance impacts; to in-farm field operations (planting, harvesting, grazing, nutrient management, etc.) as applicable to the following: • Specialty crops/cropland • Dairy/livestock operations • Field crop operations • High investment agricultural operations • Established agricultural farm communities

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
	2.4.4 Agriculture – Transportation Linkages between Integrated Agricultural Business Units	Potential to sever/disrupt transportation linkages between integrated agricultural business units (movement between integrated agricultural business units of equipment, materials, workers, etc.)
2.5 Land Use / Resources	2.5.1 First Nations People's Treaty Rights or Use of Land and Resources for Traditional Purposes (e.g. hunting, fishing, harvesting of country foods, harvesting of medicinal plants)	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • nuisance impacts; • change to access / travel time. to First Nations' treaty rights or use of land and resources for traditional purposes
	2.5.2 Parks and Recreational Areas (e.g. national/provincial parks, conservation areas)	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts; • change to access / travel time; • change to facilities / utilities / services. to parks and recreational areas.
	2.5.3 Aggregates, Mineral-Resources	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change to access / travel time; • change to facilities / utilities / services. to current/future extraction of aggregate and mineral resources.
2.6 Major Utility Transmission Corridors (e.g. railroads, hydro, gas, oil)		Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • change to access / travel time; • change to facilities / utilities / services. to major utility transmission corridors.
2.7 Contaminated Property and Waste Management (e.g. Landfills, Hazardous Waste Sites, "Brownfield" Areas, other known contaminated sites, and high-risk contamination areas)		Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change to access / travel time; • change to facilities / utilities / services. to contaminated property and waste management.
2.8 Landscape Composition	2.8.1 Scenic Composition (total aesthetic value of landscape components)	Potential and significance of change to scenic composition (total aesthetic value of landscape components).
	2.8.2 Sensitive Viewer Groups	Potential and significance of change vistas/outlooks for sensitive viewer groups.
	2.8.3 Scenic value of views/vistas from the transportation facility	Potential and significance of views/vistas from the transportation facility.
	2.8.4 Specimen Trees	Potential and significance of destruction / disturbance of specimen trees.
2.9 Air Quality	2.9.1 Regional Air Quality and Total Contaminant and Greenhouse Gas Emissions	Previously considered during the detailed planning phase.
	2.9.2 Local Air Quality and Sensitive Receptors to Air Pollutants	Potential and significance of effects on sensitive receptors to air pollutants and greenhouse gas emissions

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
3. Cultural Environmental Factors		
3.1 Cultural Heritage – Built Heritage and Cultural Landscapes	3.1.1 Buildings or "Standing" Sites of Architectural or Heritage Significance or Ontario Heritage Foundation Easement Properties	Potential and significance of: • encroachment, severance, displacement, property acquisition; • long-term alteration / disruption; • change in area character/ aesthetics; • nuisance impacts; • change to access / travel time; • change to facilities / utilities / services. to buildings or "standing" sites of extreme local, provincial or national interest or Ontario Heritage Foundation easements properties.
	3.1.2 Heritage Bridges	Potential for destruction or significant alteration of heritage bridges
	3.1.3 Areas of Historic 19th Century Settlement	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • change in area character/ aesthetics; • nuisance impacts; • change to access / travel time; • change to facilities / utilities / services. to areas of historic 19th century settlement.
	3.1.4 Cultural Heritage Landscapes (collection of individual man-made features modifying pristine landscape)	Potential and significance of change to composition of cultural landscapes.
	3.1.5 First Nations' Burial Sites	Potential and significance of: • encroachment, severance, displacement; • long-term alteration/ disruption; • change in area character / aesthetics; • nuisance impacts; • change to access / travel time. to First Nations' burial sites.
	3.1.6 Cemeteries	Potential and significance of: • encroachment, severance, displacement; • long-term alteration / disruption; • short-term alteration/disruption (construction impacts); • change in area character / aesthetics; • nuisance impacts; • change to access / travel time; • change to facilities / utilities / services. to cemeteries.
3.2 Cultural Heritage – Archaeology	3.2.1 Pre-Historic and Historic First Nations Sites	Potential for destruction or disturbance of pre-historic and historic First Nations archaeological sites of extreme local, provincial or national interest
	3.2.2 Historic Euro-Canadian Archaeological Sites	Potential for destruction or disturbance of historic Euro-Canadian archaeological sites of extreme local, provincial or national interest

Exhibit 2.1: Preliminary Design Evaluation Factors, Sub-Factors, Criteria and Indicators

FACTOR / SUB-FACTOR	CRITERIA	INDICATORS
4. Area Economy – Previously addressed during Needs Assessment Phase		
5. Transportation Factors		
5.1 Area Transportation System Capacity and Efficiency	5.1 Federal/Provincial/Municipal transportation planning policies/goals/objectives	Previously considered during the Preliminary Planning phase
	5.2 Efficient movement of people	Potential to support the efficient movement of people between communities and regions based on Level of Service (LOS) and volume to capacity (v/c) on a network, screenline and critical link basis
	5.3 Efficient movement of goods	Potential to support efficient movement of goods between urban growth centres and regional intermodal facilities based on road network and Highway 7&8 corridor performance measures (LOS and travel speed)
5.2 System reliability / redundancy		Potential to support system reliability and redundancy for travel (people and goods) between regions and communities during adverse conditions
5.3 Safety	5.3.1 Traffic Safety	Potential to improve traffic safety based on opportunity to reduce congestion on area road network (LOS and v/c) and reduce the frequency of intersections and entrances in the Highway 7&8 corridor. Potential for collisions recognizing side road intersections, presence of auxiliary lanes, number/spacing of entrances, available sight distance, storage for disabled vehicles, etc.
	5.3.2 Emergency Access	Potential to support emergency access to/from existing and/or new provincial facilities.
	5.3.3 Pedestrian, Cyclist and Snowmobile Safety within the highway right-of-way	Potential and significance of change to ease and safety of movement across the highway and within the right-of-way
5.4 Mobility and Access	5.4.1 Modal integration, balance and efficiency	Potential to improve modal choice and increase mode split between communities, regions and intermodal facilities based on travel performance indicators (LOS, v/c, travel speed) at critical screenlines and on potential to provide higher order transit service.
	5.4.2 Linkages to Population and Employment Centres	Potential to improve linkages to population and employment centres for people and goods movement
	5.4.3 Recreation and Tourism Travel	Potential to support recreation and tourism travel within and to/from the Analysis Area by provision of higher order network (roads and transit) continuity and connectivity and through network performance indicators (LOS, v/c, travel speed)
	5.4.4 Accommodate mobility of pedestrians, cyclists and snowmobiles	Potential to accommodate mobility of pedestrians, cyclists within critical travel corridors in urbanized areas and snowmobiles in recognized rural trails
5.5 Network Compatibility	5.5.1 Network Connectivity	Potential to improve transportation system connectivity within and to/from the analysis area
	5.5.2 Flexibility for Future Expansion	Potential to address future transportation needs beyond the forecasted planning horizon
5.6 Engineering	5.6.1 Constructability	Potential ease of implementation considering feasibility/difficulty of physical, property or environmental constraints
	5.6.2 Compliance with Design Criteria	Conformity to applicable provincial safety and design standards
5.7 Traffic Operations		Potential for negative impact on traffic operations due to factors such as design features, private access, and transportation network connections
5.8 Construction Cost (excludes property costs and engineering costs)		Relative road construction cost, excluding property and engineering costs

2.3 Segment A: West of Road 125 to West Limit of Stratford

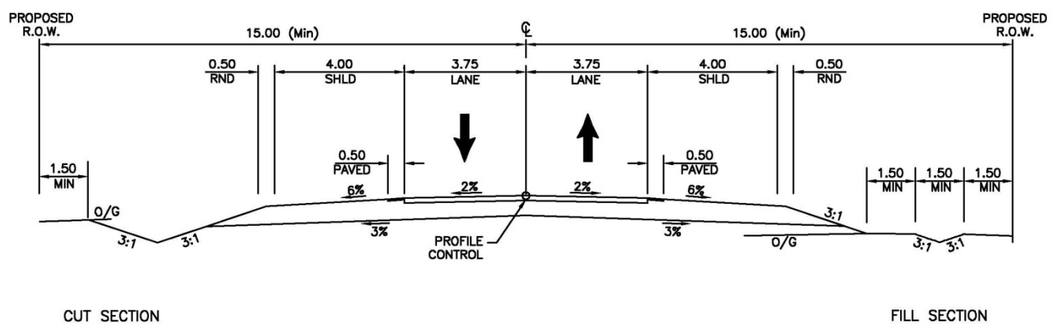
Segment A extends from west of Road 125 to the west limit of Stratford. Within this segment there are three crossing roads, specifically:

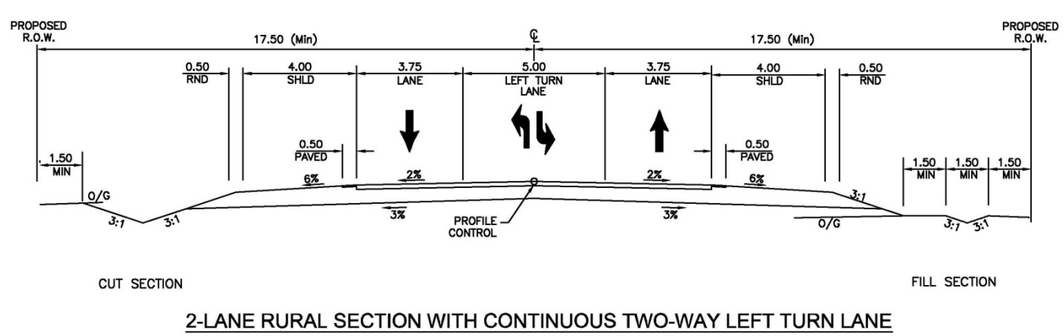
- Road 125 at Highway 8
- Road 125 at Perth Line 32
- O'Loane Avenue

2.3.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for a rural highway cross section of two lanes, with or without a continuous two-way centre left-turn lane on Perth Line 32 as illustrated in **Exhibit 2.2**.

Exhibit 2.2: Segment A Highway Cross Section Alternatives





The Preliminary Design Alternatives for Segment A are detailed in **Exhibit 2.3**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix A**.

Six Preliminary Design Alternatives were generated for Segment A and presented at PIC #5 for review and comment. Based on the transportation requirements from a capacity, operations and safety perspective and in consideration of the environmental constraints along this segment of the route, additional design analysis was completed by the study team and Alternative A6 was refined.

Alternative A6 was previously presented (in Report I and at PIC #5) with roundabouts as the crossing road intersection treatment for all three crossing roads. Alternative A6 was refined to include an unsignalized intersection at O'Loane Avenue instead of a roundabout (note: the roundabouts at Road 125 / Highway 8 and Road 125 / Perth Line 32 were retained).

Exhibit 2.3: Segment A Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternatives	Crossing Road Intersection Treatment Alternatives		
		Road 125 / Highway 8	Road 125 / Perth Line 32	O'Loane Avenue
A1	2-lanes	Signalized intersection	Signalized intersection	Unsignalized intersection, with stop signs on the crossing road
A2		Signalized intersection with channelization	Signalized intersection with channelization	Unsignalized intersection, with stop signs on the crossing road
A3		1-lane roundabout	1-lane roundabout	1-lane roundabout
A4	2-lanes on Road 125; 2-lanes with 5m continuous two-way centre left-lane on Line 32	Signalized intersection	Signalized intersection	Unsignalized intersection, with stop signs on the crossing road
A5		Signalized intersection with channelization	Signalized intersection with channelization	Unsignalized intersection, with stop signs on the crossing road
A6		1-lane roundabout	1-lane roundabout	Unsignalized intersection, with stop signs on the crossing road

2.3.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment A is provided in **Appendix A**.

The preferred alternative for Segment A is Alternative A6 which consists of 2-lanes with a continuous 5m two-way centre left turn lane on Line 32; roundabouts at both crossing roads on Road 125 and stop sign control at O'Loane Avenue. The key reasons Alternative A6 is preferred are:

- The centre left turn lane on Line 32 provides improved operational and safety performance with minimal footprint impact to adjacent properties.
- The roundabouts provide the best bi-directional and uninterrupted flow where Highway 7&8 changes direction at Road 125.

2.4 Segment B: West Limit of Stratford to West of Erie Street

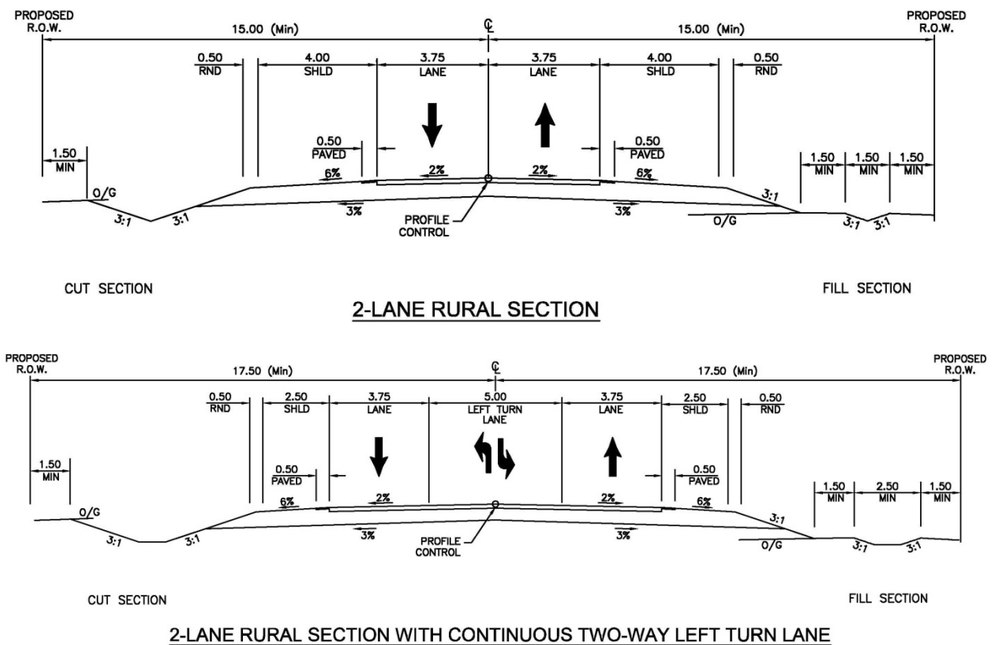
Segment B extends from the west limit of Stratford to just west of Erie Street. Within this segment there are six crossing roads, specifically:

- Freeland Drive
- Queensland Road
- Wright Boulevard
- St. Vincent Street
- Monteith Avenue
- Linton Avenue

2.4.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for a rural highway cross section of two lanes, with or without a continuous two-way centre left-turn lane, as illustrated in **Exhibit 2.4**.

Exhibit 2.4: Segment B Highway Cross Section Alternatives



The Preliminary Design Alternatives for Segment B are detailed in **Exhibit 2.5**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix B**.

Two Preliminary Design Alternatives were generated for Segment B and presented at PIC #5 for review and comment. No refinements to the Preliminary Design Alternatives in Segment B were made subsequent to PIC #5.

Exhibit 2.5: Segment B Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternatives	Crossing Road Intersection Treatment Alternatives					
		Freeland Dr	Queensland Rd	Wright Blvd	St. Vincent St	Monteith Ave	Linton Ave
B1	2-lanes	Unsignalized intersection, with stop signs on the crossing road	Unsignalized intersection, with stop signs on the crossing road	Unsignalized intersection, with stop signs on the crossing road	Unsignalized intersection, with stop signs on the crossing road	Cul-de-sac	Cul-de-sac
B2	2-lanes, 5m continuous two-way centre left-lane						

2.4.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment B is provided in **Appendix B**.

The preferred alternative for Segment B is Alternative B2 which consists of 2-lanes with a continuous 5m two-way centre left turn lane with intersection treatments as detailed above. The key reasons Alternative B2 is preferred are:

- The centre left turn lane on Lorne Avenue provides improved operational and safety performance with minimal footprint impact to adjacent properties.
- It recognizes an urban cross section may be required to avoid frontage impacts to two pioneer cemeteries east of O'Loane Avenue.

2.5 Segment C: West of Erie Street to East of East Limit of Stratford, including Erie Street

Segment C extends from west of Erie Street to east of the East Limit of Stratford and includes the portion of Erie Street from Lorne Avenue southerly to Line 29 / Gibb Road. Within this segment there are five main crossing roads, specifically:

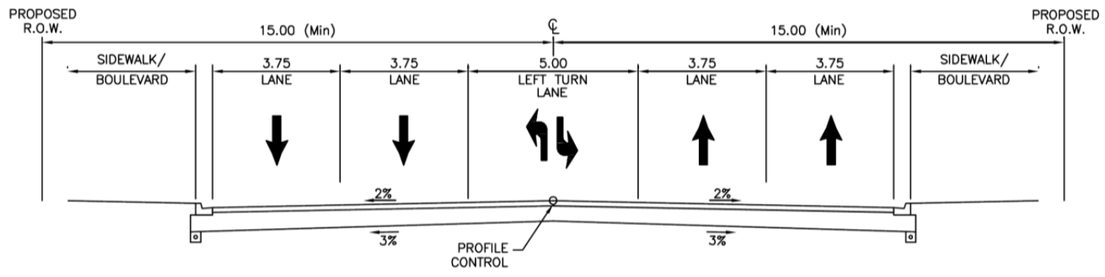
- Erie Street at Lorne Avenue
- Downie Street at Lorne Avenue
- Romeo Street at Lorne Avenue
- Embro Road at Erie Street
- Line 29 / Gibb Road at Erie Street

There are also a number of minor road connections within this segment.

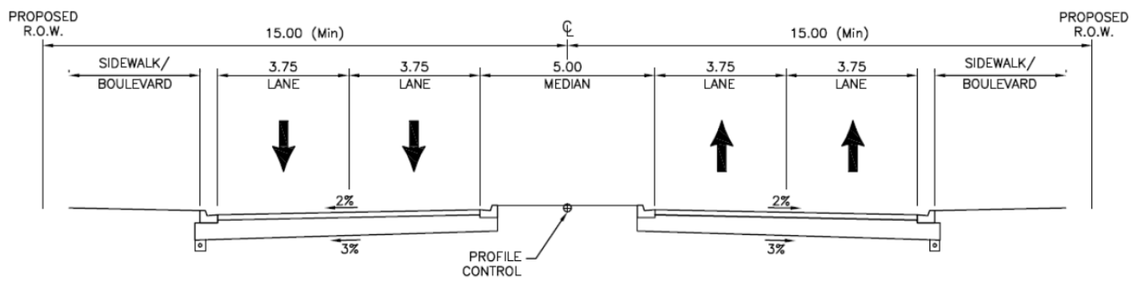
2.5.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for an urban highway cross section of four lanes, with a continuous two-way centre left-turn lane or a raised median, as illustrated in **Exhibit 2.6**.

Exhibit 2.6: Segment C Highway Cross Section Alternatives



4-LANE URBAN SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE



4-LANE URBAN SECTION WITH RAISED 5m MEDIAN

The Preliminary Design Alternatives for Segment C are detailed in **Exhibit 2.7**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix C**.

Three Preliminary Design Alternatives were generated for Segment C and presented at PIC #5 for review and comment. No refinements to the Preliminary Design Alternatives in Segment C were made subsequent to PIC #5.

Exhibit 2.7: Segment C Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternatives	Crossing Road Intersection Treatment Alternatives				
		Erie St. / Lorne Ave	Downie St. / Lorne Ave	Romeo St. / Lorne Ave	Embro Rd. / Erie St.	Line 29 / Erie St.
C1	4-lanes, 5m continuous two-way centre left-lane	Signalized intersection	Signalized intersection	Signalized intersection	Signalized intersection	Signalized intersection
C2		2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout
C3	4-lanes, 5m raised median	2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout

2.5.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment C is provided in **Appendix C**.

The preferred alternative for Segment C is Alternative C1 which consists of 4-lanes with a continuous 5m two-way centre left turn lane signalized intersections at the main intersection noted in Exhibit 2.7 and cul-de-sacs at Dunlop Place and Scott Street. The key reasons Alternative C1 is preferred are:

- The centre left turn lane on Lorne Avenue and Erie Street provides improved operational and safety performance and maintains current direct access to and from highway for commercial / industrial and other properties fronting the highway (i.e. no out of way travel).
- It maintains current emergency vehicle access to and from highway.
- It minimizes footprint impacts to land and buildings on adjacent properties.
- It provides the best overall level of service for projected travel demands.
- It best supports pedestrian / cyclist movements within and across the right-of-way.

2.6 Segments D and E: East of East Limit of Stratford to East of Road 106

Segment D extends from east of the east limit of Stratford to east of Road 110. Segment E extends from east of Road 110 to east of Road 106. Within these segments, two route alternatives were considered, specifically the previously selected south bypass route and the north bypass route which utilizes a segment of Road 110 to connect from the Lorne Avenue corridor to existing Highway 7&8.

As noted previously, Segments D and E were combined and the north and south bypass alternatives were comparatively evaluated recognizing that the preferred alternative east of Stratford is in part dependent upon the preferred alternative for the Shakespeare area.

2.6.1 Shakespeare South Bypass Preliminary Design Alternatives

Preliminary Design Alternatives for the south bypass were generated for a rural highway cross section of four lanes with a 7m median for the new alignment section and a rural or an urban highway cross section of four lanes with a continuous two-way centre left-turn lane for existing alignment sections as illustrated in **Exhibit 2.8**.

For the south bypass route, there are eight crossing roads, specifically:

- Road 111
- Road 110 / Perth Line 33 Connection
- Road 109 at New Highway 7&8
- Road 109 at Existing Highway 7&8
- Road 108
- Road 107
- Existing Highway 7&8 east of Shakespeare
- Road 106

The Preliminary Design Alternatives for the south bypass are detailed in **Exhibit 2.9**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix D**.

Four Preliminary Design Alternatives were generated for the south bypass and presented at PIC #5 for review and comment. Based on stakeholder input, consideration of the safety and operation of the highway with regard to driver expectation and consistency of intersection treatments and consideration of the environmental conditions and constraints along this segment of the route, the preliminary design alternatives were refined to provide a more consistent intersection treatment throughout.

In addition, in response to stakeholder input, two additional south bypass sub-alternatives for the west end of this segment were generated as follows:

- Link between south bypass and Lorne Avenue shifted westerly to be centred on Road 110.
- Link shifted to the west side of the municipal drain, remaining roughly parallel to the municipal drain so the edge of the right-of-way slightly encroaches into the westerly edge of the large woodlot.

The two additional alternatives were comparatively evaluated based on the higher level of preliminary design detail relative to the west end of the best south bypass alternative identified through the evaluation of the original four alternatives. The alternative alignments and evaluation results are provided in **Appendix D**.

Refining the south bypass alternative by shifting the alignment to the west side of the municipal drain resulted in reduced impacts to the large woodlot and to agricultural field operations. Therefore, this refinement was determined to be more preferred than the previous “best” south bypass alternative so it was carried forward for further assessment.

2.6.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Shakespeare South Bypass Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segments D and E is provided in **Appendix D**.

The preferred south bypass alternative is South Alternative DE1 which consists of:

- 4-lanes, a 7m median for new alignment sections, a continuous two-way centre left-turn lane for existing alignment sections and localized sections of urban highway cross section
- Signalized intersections at Road 111, the Road 110 / Perth Line 33 Connection Road 109 at New Highway 7&8, Road 109 at Existing Highway 7&8 and Road 107
- A grade separation at Road 108
- Stop sign control at Road 106
- Access to Shakespeare via full moves intersection controlled by traffic signals at Road 107, a slip off provision for Highway 7&8 westbound traffic at east limit of village and retention of existing highway access at west limit of village
- Access to east end of Stratford via a Road 109 connection between the south bypass and existing Highway 7&8

The key reasons South Alternative DE1 is preferred are it:

- Does not impact areas of interior forest.
- Does not impact use of residential property at Road 106 as much as other alternatives.
- Impacts fewer agricultural properties with fewer parcels severed and least area of agricultural field landlocked.
- Results in least disruption to transportation linkages between Integrated Agricultural Business Units.
- Provision of full moves access at the majority of the crossing road via traffic signals or stop sign control on the crossing road provides improved operational and safety performance and maintain current direct access to and from the highway for local traffic and emergency service.

2.6.3 Shakespeare North Bypass Preliminary Design Alternatives

Preliminary Design Alternatives for the north bypass were generated for a rural highway cross section of four lanes with a 7m median for the new alignment section and a rural or an urban highway cross section of four lanes with a continuous two-way centre left-turn lane for existing alignment sections as illustrated in **Exhibit 2.10**.

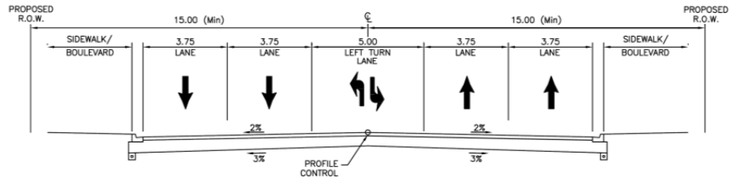
For the north bypass route, there are nine crossing roads within this segment, specifically:

- Road 111
- Road 110 / Perth Line 33 Connection
- Existing Highway 7&8 Connection
- Road 109
- Road 108
- Existing Highway 7&8 west of Shakespeare
- Road 107
- Existing Highway 7&8 east of Shakespeare
- Road 106

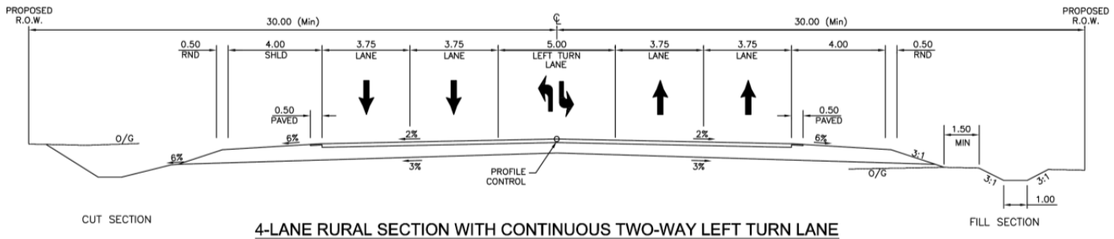
The Preliminary Design Alternatives for north bypass are detailed in **Exhibit 2.11**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix D**.

Exhibit 2.8: Segments D and E - South Bypass Highway Cross Section Alternatives

Segment D Highway Cross Section Alternatives

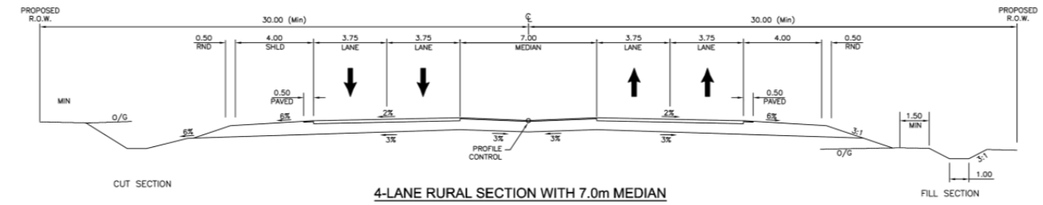


4-LANE URBAN SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

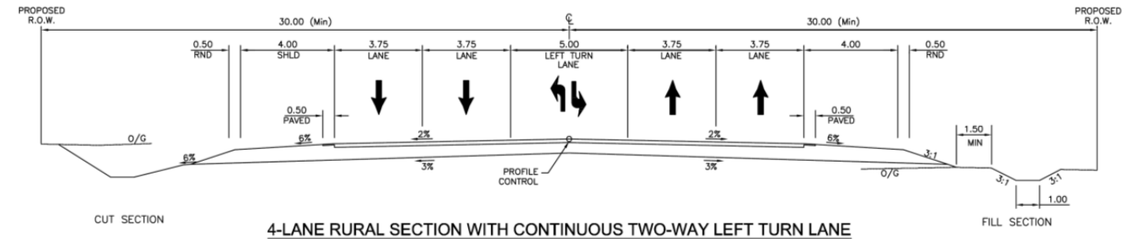


4-LANE RURAL SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

Segment E Highway Cross Section Alternatives



4-LANE RURAL SECTION WITH 7.0m MEDIAN



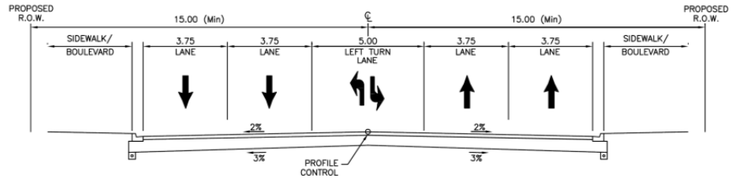
4-LANE RURAL SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

Exhibit 2.9: Segments D and E - South Bypass Preliminary Design Alternatives

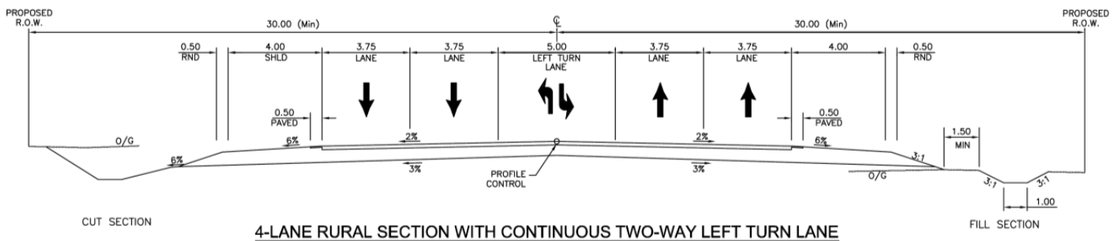
Alt No.	Highway Cross Section Alternative	Crossing Road Intersection Treatment Alternative								
		Road 111	Road 110 / Connection to Perth Line 33	Road 109 and bypass alternative	Road 109 and Existing Highway 7&8	Road 108	Connection to Highway 7&8 at west limit of Shakespeare	Road 107	Connection to Existing Highway 7&8 at east limit of Shakespeare	Road 106
South DE1	4-lanes, 7m median for new alignment section and continuous two-way centre left-turn lane for existing alignment section	Signalized intersection	Signalized intersection	Signalized intersection	Signalized intersection	Grade Separation (no highway access)	Not Applicable	Signalized intersection	No access from Shakespeare to Highway 7&8 eastbound. Slip off from Highway 7&8 westbound into Shakespeare	Unsignalized Intersection, with stop signs on crossing road
South DE2		Signalized intersection	Signalized intersection	Signalized intersection	Signalized intersection	Grade Separation (no highway access)	Not Applicable	Signalized intersection		Grade Separation (no highway access)
South DE3		2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout	Grade Separation (no highway access)	Not Applicable	2-lane roundabout		Unsignalized Intersection, with stop signs on crossing road
South DE4		2-lane roundabout	2-lane roundabout	2-lane roundabout	2-lane roundabout	Grade Separation (no highway access)	Not Applicable	2-lane roundabout		Grade Separation (no highway access)

Exhibit 2.10: Segments D and E - North Bypass Highway Cross Section Alternatives

Segment D Highway Cross Section Alternatives

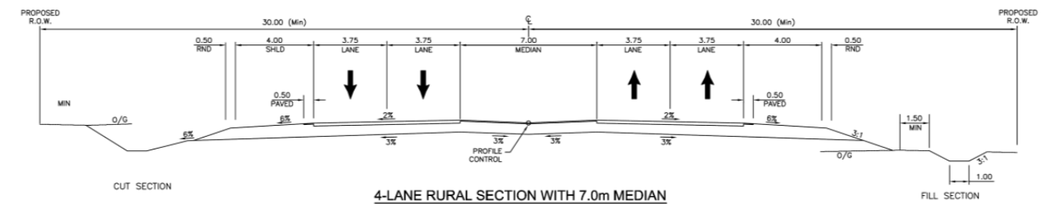


4-LANE URBAN SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

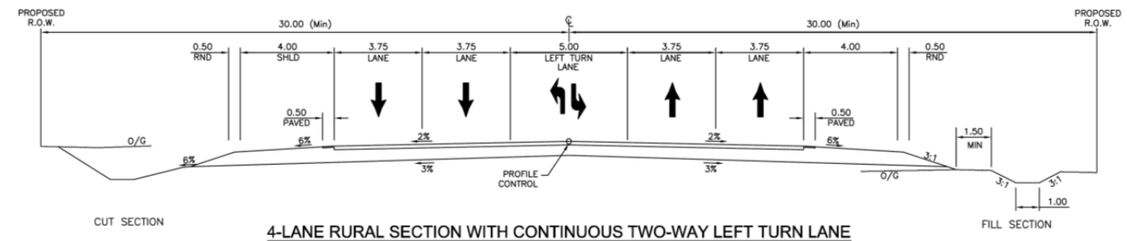


4-LANE RURAL SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

Segment E Highway Cross Section Alternatives



4-LANE RURAL SECTION WITH 7.0m MEDIAN



4-LANE RURAL SECTION WITH CONTINUOUS TWO-WAY LEFT TURN LANE

Exhibit 2.11: Segments D and E - North Bypass Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternative	Crossing Road Intersection Treatment Alternative								
		Road 111	Road 110 / Connection to Perth Line 33	Connection to Existing Highway 7&8	Road 109 and Existing Highway 7&8	Road 108	Connection to Highway 7&8 at west limit of Shakespeare	Road 107	Connection to Existing Highway 7&8 at east limit of Shakespeare	Road 106
North DE1	4-lanes, 7m median for new alignment section and continuous two-way centre left-turn lane for existing alignment section	Signalized intersection	Signalized intersection	Signalized intersection	Unsignalized intersection, with stop signs on crossing road	Unsignalized intersection, with stop signs on crossing road	No access from Shakespeare to Highway 7&8 westbound. Slip off from Highway 7&8 eastbound into Shakespeare.	Signalized intersection	No access into Shakespeare from Highway 7&8 westbound. Slip on from Shakespeare to Highway 7&8 eastbound.	Unsignalized Intersection, with stop signs on crossing road
North DE2		Signalized intersection	Signalized intersection	Signalized intersection	Grade Separation (no highway access)	Grade Separation (no highway access)		Signalized intersection		Grade Separation (no highway access)
North DE3		2-lane roundabout	2-lane roundabout	2-lane roundabout	Unsignalized intersection, with stop signs on crossing road	Unsignalized intersection, with stop signs on crossing road		2-lane roundabout		Unsignalized Intersection, with stop signs on crossing road
North DE4		2-lane roundabout	2-lane roundabout	2-lane roundabout	Grade Separation (no highway access)	Grade Separation (no highway access)		2-lane roundabout		Grade Separation (no highway access)

Four Preliminary Design Alternatives were generated for the north bypass and presented at PIC #5 for review and comment. Based on stakeholder input, consideration of the safety and operation of the highway with regard to driver expectation and consistency of intersection treatments and consideration of the environmental conditions and constraints along this segment of the route, the preliminary design alternatives were refined to provide a more consistent intersection treatment throughout.

Furthermore, in response to stakeholder input, two additional north bypass sub-alternatives for the west end of this segment were generated as follows:

- North bypass continues along existing Highway 7&8 to Road 111 and then heads south to connect to Perth Line 33 / Lorne Avenue.
- North bypass continues along existing Highway 7&8 to "gap" in development west of Road 111 and then heads south to connect to Perth Line 33 / Lorne Avenue.

The two additional alternatives were comparatively evaluated based on the higher level of preliminary design detail relative to the west end of the best north bypass alternative identified through the evaluation of the original four alternatives. The alternative alignments and evaluation results are provided in **Appendix D**.

Refining the best north bypass alternative by using Road 111 as the link to Perth Line 33 / Lorne Avenue impacts approximately 4 hectares less agricultural land, 13 fewer agricultural properties (1 less severance, 12 fewer frontage takings), but impacts 27 more residential properties (including 10 residences displaced) and 6 more commercial properties (including severances and building displacement). In addition, it impacts the Little Lakes Bog and Swamp Area of Natural and Scientific Interest along the existing highway. This refinement was determined to be less preferred than the previous "best" north bypass alternative so it was not carried forward for further assessment.

Similarly, refining the best north bypass by using Highway 7&8 until the 'gap' in development at the east side of Stratford (west of Road 111), results in the additional impacts noted above for residential and commercial properties and also displaces approximately 3 hectares more agricultural land than the previous "best" north bypass alternative. This sub-alternative was deemed less preferred than the previous "best" north bypass alternative and not carried forward for further assessment.

2.6.4 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Shakespeare North Bypass Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segments D and E is provided in **Appendix D**.

The preferred north bypass alternative is North Alternative DE1 which consists of:

- 4-lanes, a 7m median for new alignment sections, a continuous two-way centre left-turn lane for existing alignment section and localized sections of urban highway cross section
- Signalized intersections at Road 111; the Road 110 / Perth Line 33 connection and Road 107
- A grade separation at Road 108
- Stop sign control at Road 109 and Road 106
- At west limit of village, no access from Shakespeare to Highway 7&8 westbound. Slip off from Highway 7&8 eastbound into Shakespeare.
- At east limit if village, no access into Shakespeare from Highway 7&8 westbound. Slip on from Shakespeare to Highway 7&8 eastbound.

The key reasons North Alternative DE1 is preferred are it:

- Requires fewer crossings of Sheerer Municipal Drain
- Displaces less agricultural land (0.5 ha or greater, less land than other alternatives)
- Results in least disruption to transportation linkages between Integrated Agricultural Business Units
- Provision of full moves access at the majority of the crossing road via traffic signals or stop sign control on the crossing road provides improved operational and safety performance and maintain current direct access to and from the highway for local traffic and emergency service.

2.6.5 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Shakespeare Bypass Alternative

As previously noted, the evaluation of Shakespeare Bypass Preliminary Design Alternatives in Segments D and E was completed in steps. Having identified a preferred South bypass alternative and a preferred North bypass alternative, the preferred north and south bypass alternatives were comparatively evaluated to identify a preferred Preliminary Design Alternative for the Shakespeare area and the area east of Stratford.

The detailed evaluation of Shakespeare Bypass Preliminary Design Alternatives for Segments D and E is provided in **Appendix D**.

The preferred bypass alternative is South Bypass Alternative DE1 which consists of 4-lanes with 7m median for new alignment section, a continuous two-way centre left-turn lane for existing alignment section and localized sections of urban highway cross section, signalized intersections (with channelization at Road 109) at all crossing roads except at Road 108 which is grade separated and stop sign control at Road 106. Access to Shakespeare via full moves intersection controlled by traffic signals at Road 107, a slip off provision for Highway 7&8 westbound traffic at east limit of village and retention of existing highway access at west limit of village.

The key reasons South Alternative DE1 is preferred are it:

- Better addresses transportation objectives of the study:
  - More direct transportation route; effectively directs traffic to primary or major destinations
  - Better diverts traffic from parallel routes because more traffic originates and is destined for the south
  - Does not draw traffic from/to the south through Shakespeare on Road 107
  - Provides rail grade separations for Roads 109, 108 and 107
- Lower impacts on the business area of Shakespeare because better able to attract tourist traffic into the village:
  - Westbound tourist traffic (the predominant direction of tourist shoppers) is able to "slip off" the south bypass directly into Shakespeare (north bypass westbound must exit at Road 107 and head south)

  - Eastbound tourist traffic can access the village via existing Highway 7&8 or via the south bypass and Road 107

- Results in essentially equal overall agricultural impacts as the north bypass:
  - South bypass requires 24 hectares more land, while north bypass displaces 4 more agricultural buildings and impacts 6 more farm property
  - South bypass causes fewer agricultural severances (7 vs 8); furthermore 5 of the south bypass severances involve properties that are already severed by the railway with private crossings that are vulnerable to closure in the event of rail service upgrades
  - Both alternatives potentially land lock the same number of farm parcels (5 parcels) however, the land locked on 2 parcels impacted by the south bypass are forested areas not in use as agricultural field
  - Provides rail grade separations for Roads 109, 108 and 107 that better accommodates movement of farm vehicles and improves safety
  - Does not introduce north Shakespeare ring road that may support extension of Shakespeare urban boundary for development of agricultural lands

2.7 Segment F: East of Road 106 to West of Regional Road 1

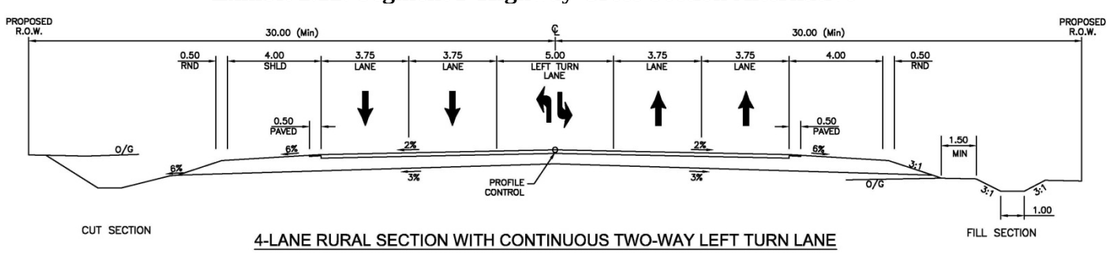
Segment F extends from east of Road 106 to west of Regional Road 1. Within this segment there are two crossing roads, specifically:

- Road 104
- Road 102

2.7.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for a rural highway cross section of four lanes, with a continuous two-way centre left-turn lane, as illustrated in **Exhibit 2.12**.

Exhibit 2.12: Segment F Highway Cross Section Alternative



The Preliminary Design Alternatives for Segment F are detailed in **Exhibit 2.13**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix E**.

Two Preliminary Design Alternatives were generated for Segment F and presented at PIC #5 for review and comment. Subsequent to PIC #5, based on stakeholder input, one additional preliminary design alternative was generated (Alternative F3) which maintains at-grade access at both Roads 104 and 102 through the provision of stop sign control on the crossing roads.

Exhibit 2.13: Segment F Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternative	Crossing Road Intersection Treatment Alternatives	
		Road 104	Road 102
F1	4-lanes, 5m continuous two-way centre left-lane	Unsignalized intersection, with stop signs on crossing road	Grade separation, carrying crossing road over highway (no highway access)
F2		Grade separation, carrying crossing road over highway (no highway access)	Unsignalized intersection, with stop signs on crossing road
F3		Unsignalized intersection, with stop signs on crossing road	Unsignalized intersection, with stop signs on crossing road

2.7.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment F is provided in **Appendix E**.

The preferred alternative for Segment F is Alternative F3 which consists of 4-lanes with a continuous 5m two-way centre left turn lane and stop controlled intersection treatments at both Roads 104 and 102. The key reasons Alternative F3 is preferred are:

- The centre left turn lane on Highway 7&8 provides improved operational and safety performance.
- It maintains current direct access to and from the highway for agricultural businesses and other users (i.e. no out of way travel).
- It maintains current emergency vehicle access to and from highway.
- It recognizes that the relatively low traffic on Roads 104 and 102 has minimal impact to Highway 7&8 operations.

2.8 Segment G: West of Regional Road 1 to West of Nafziger Road

Segment G extends from west of Regional Road 1 to west of Nafziger Road. Within this segment there are five crossing roads, specifically:

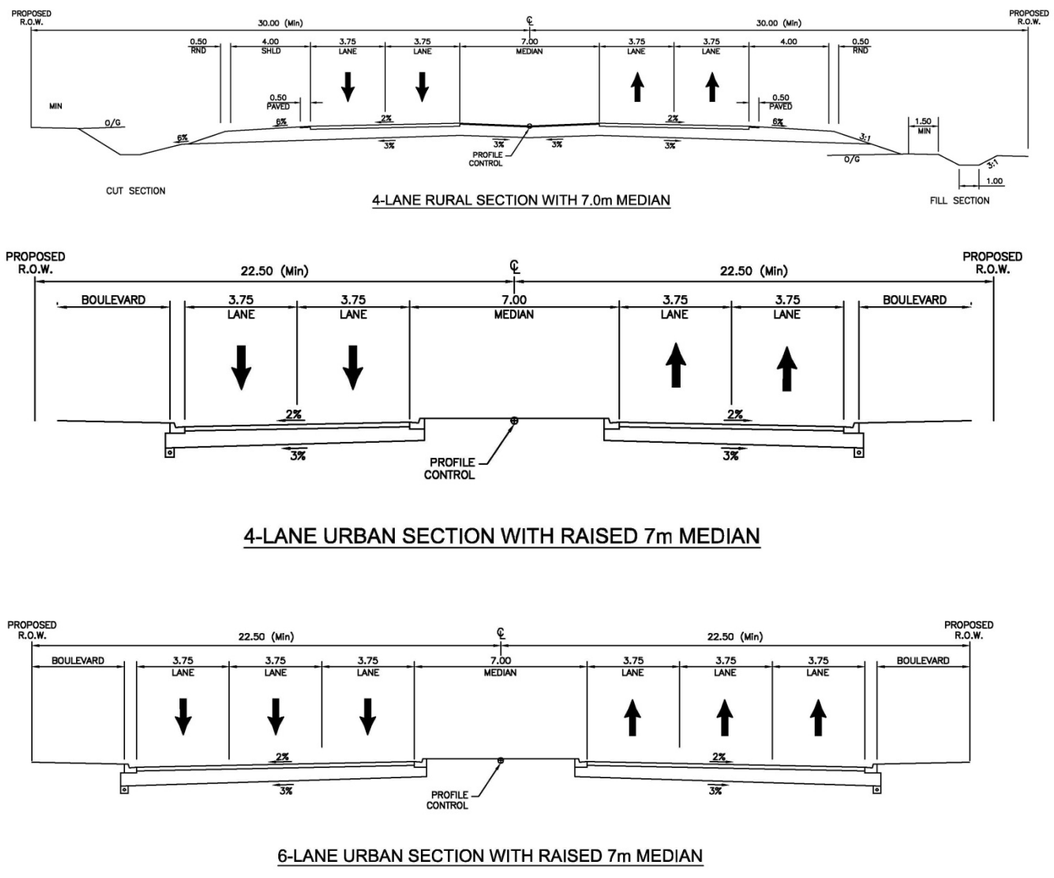
- Regional Road 1 (Wilmot-Easthope Road)
- Walker Road
- Peel Street / Haysville Road
- Victoria Street
- Hamilton Street / Bleams Road

2.8.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for two highway cross sections as described below and illustrated in **Exhibit 2.14**:

- Four lane rural cross section with a six lane urban section from west of Peel Street to east of Hamilton Street for the signalized intersection alternative, with a 7m median throughout (median treatment to be determined during detail design)
- Four lane rural cross section with a four lane urban section from west of Peel Street to east of Hamilton Street, with a 7m median (median treatment to be determined during detail design)

Exhibit 2.14: Segment G Highway Cross Section Alternative



The Preliminary Design Alternatives for Segment G are detailed in **Exhibit 2.15**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix F**.

Two Preliminary Design Alternatives were generated for Segment G and presented at PIC #5 for review and comment. Based on stakeholder input, consideration of the safety and operation of the highway with regard to driver expectation and consistency of intersection treatments and consideration of the environmental conditions and constraints along this segment of the route, Alternative G1 was refined to provide a full moves intersection at Walker Road with stop sign control provided on the crossing road.

Exhibit 2.15: Segment G Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternatives	Crossing Road Intersection Treatment Alternatives				
		Regional Road 1	Walker Road	Peel Street	Victoria St.	Hamilton St.
G1	4-lanes with 6-lane segment from west of Peel Street to east of Hamilton Street, 7m median	Signalized intersection	Unsignalized, with stop signs on crossing road	Signalized intersection	Cul-de-sac	Signalized intersection
G2	4-lanes, 7m median	Signalized intersection	Unsignalized, right in / right out intersection	Diamond interchange (north side) / Buttonhook interchange (south side)	Cul-de-sac	Parclo B-2 interchange (north side) / Buttonhook interchange (south side) interchange

2.8.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment G is provided in **Appendix F**.

The preferred alternative for Segment G is Alternative G1 which consists of 4-lanes with a 6-lane segment from west of Peel Street to east of Hamilton Street, a 7m median, signalized intersections at Regional Road 1, Peel Street and Hamilton Street, an unsignalized intersection at Walker Road and a cul-de-sac at Victoria Street. The key reasons Alternative G1 is preferred are:

- The 7 m median improves traffic safety.
- It minimizes footprint impacts to residential, commercial and industrial properties and community facilities.
- It avoids the need for an additional bridge across the Nith River.

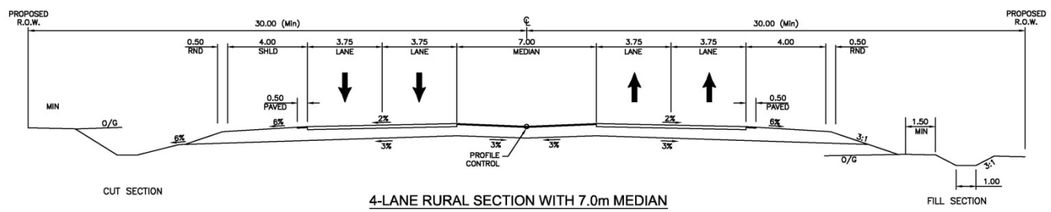
2.9 Segment H: West of Nafziger Road to East of Nafziger Road

Segment H extends from west of Nafziger Road to east of Nafziger Road. There is one crossing road within this segment, specifically Nafziger Road.

2.9.1 Preliminary Design Alternatives

Preliminary Design Alternatives for this segment were generated for a rural highway cross section of four lanes, with a 7m median, as illustrated in **Exhibit 2.16**.

Exhibit 2.16: Segment H Highway Cross Section Alternative



The Preliminary Design Alternatives evaluated for Segment H are detailed in **Exhibit 2.17**. Mapping of the alternative crossing road intersection treatments is provided in **Appendix G**.

Three Preliminary Design Alternatives were generated for Segment H and presented at PIC #5 for review and comment. Subsequent to PIC #5, based on stakeholder input, two additional preliminary design alternatives were generated (Alternatives H4 and H5) which avoided the displacement of existing industrial developments in the northwest quadrant of the intersection.

Exhibit 2.17: Segment H Preliminary Design Alternatives

Alt No.	Highway Cross Section Alternative	Crossing Road Intersection Treatment Alternatives
H1	4-lanes, 7m median	Diamond Interchange (interchange ramps in all four quadrants)
H2		Parclo A2 Interchange (interchange ramps in NE and SW quadrants)
H3		Parclo B2 Interchange (interchange ramps in NW and SE quadrants)
H4		Parclo A2 / B2 Interchange (interchange ramps on the east side of Nafziger Road in NE and SE quadrants)
H5		Buttonhook / B2 Interchange (interchange ramps in NW and SE quadrants)

2.9.2 Assessment and Evaluation of Preliminary Design Alternatives and Selection of a Preferred Preliminary Design Alternative

The detailed evaluation of Preliminary Design Alternatives for Segment H is provided in **Appendix G**.

The preferred alternative in Segment H is Alternative H5 which consists of 4-lanes with a 7m median and an interchange at Nafziger Road with all ramps located in the northwest and southeast quadrants. The key reasons Alternative H5 is preferred are:

- The 7 m median improves traffic safety.
- It avoids impacts to the recreational complex soccer fields.
- It minimizes footprint impacts to the MTO patrol yard and industrial properties along the west side of Nafziger Road.

3.0 SUMMARY OF PREFERRED PRELIMINARY DESIGN ALTERNATIVE (RECOMMENDED PLAN)

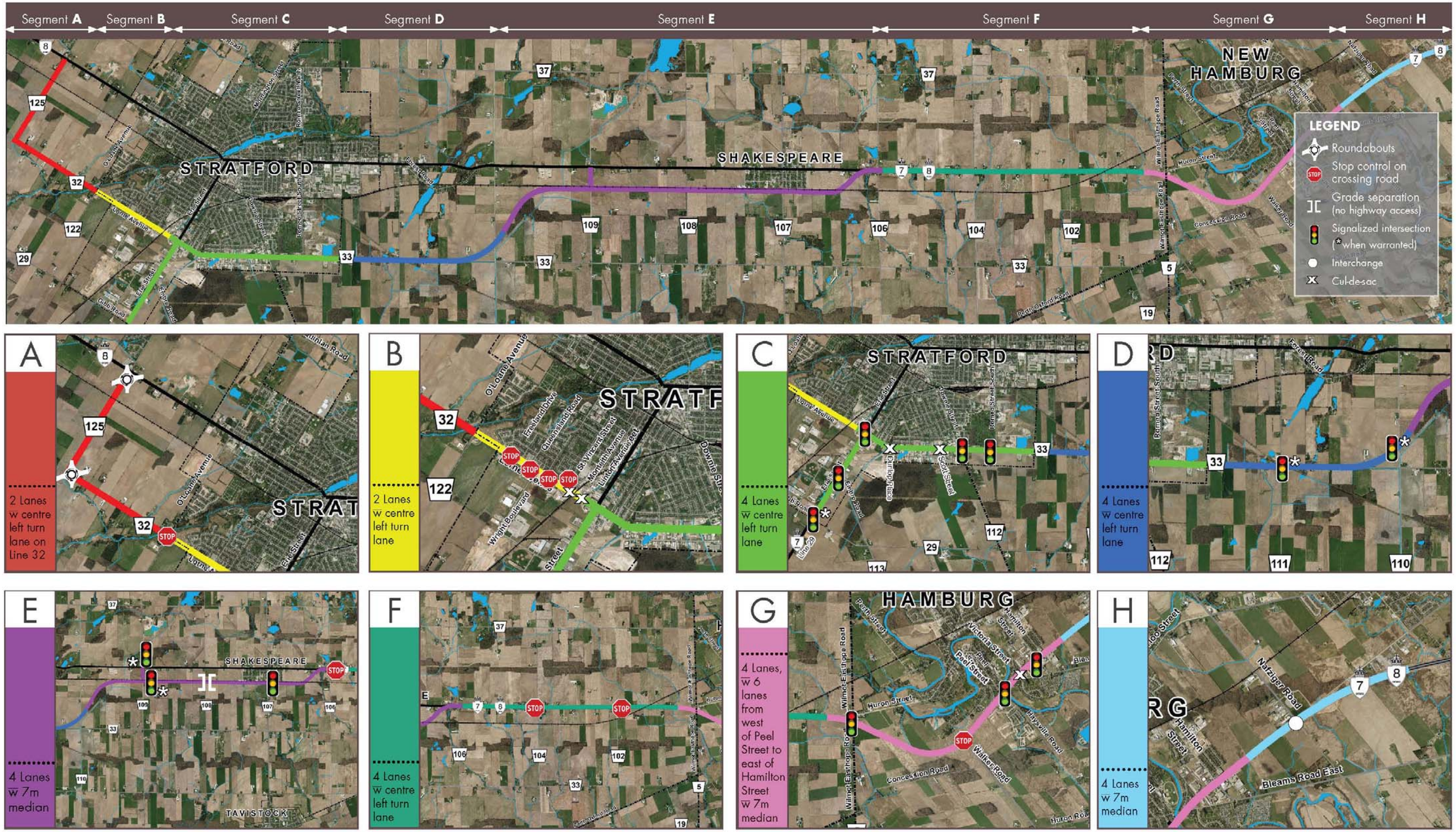
On the basis of the assessment and evaluation of Preliminary Design Alternatives presented in Section 2.0, the Recommended Plan includes:

- Southerly bypass of Shakespeare adjacent to the existing GEXR railway corridor.
- 2-lane cross-section with a 5 m two-way centre left turn lane from Highway 8 along Line 32 to Erie Street
- 4-lane cross-section from Erie Street easterly to east study limit, including Erie Street southerly to Perth Line 29, with:
  - 5 m two-way centre left turn lane from Erie Street to west of Shakespeare bypass, from east of Shakespeare bypass to Wilmot / Easthope Road / RR 1 and on Erie Street southerly to Perth Line 29
  - 7 m median for Shakespeare bypass, from Wilmot / Easthope Road / RR 1 to west of Peel Street and from east of Hamilton Road to east study limit
  - 6-lane cross-section from west of Peel Street to east of Hamilton Road to serve these high-traffic at-grade intersections
- Full moves intersections controlled by traffic signals or stop signs on the crossing roads for majority of crossing roads.
- Roundabouts at Perth Road 125 where Highway 7&8 changes direction.
- Access to Shakespeare via a full moves intersection controlled by traffic signals at Road 107, a slip off provision for Highway 7&8 westbound traffic at the east limit of the village and retention of existing highway access at the west limit of the village.
- Access to the east end of Stratford via a Road 109 connection between the south bypass and existing Highway 7&8.
- Cul-de-sac at several intersections in Stratford, at one intersection in New Hamburg, and for eastbound traffic on the existing highway in Shakespeare at the east limit of the village.
- Interchange at Nafziger Road.

Exhibit 3.1 provides a summary overview of the Recommended Plan. Preliminary design drawings for the Recommended Plan, as presented at PIC #6, are available on the study website.

The evaluation tables identifying the preferred Preliminary Design Alternative are presented in **Appendix A** through **G**. Mapping of the Preliminary Design Alternatives and the preferred alternative for each Segment is also provided in **Appendix A** through **G**.

Exhibit 3.1: Overview of Recommended Plan (Preferred Preliminary Design Alternative)



4.0 FILING AND REVIEW OF TRANSPORTATION ENVIRONMENTAL STUDY REPORT

The Transportation Environmental Study Report (TESR) is an assembly of the study working papers and milestone reports into a single document. The contents of the TESR are provided in **Exhibit 4.1** below:

Exhibit 4.1: Transportation Environmental Study Report Contents
1. Purpose, Relevance and Position of Report Within The Study Process
2. Summary Description of the Undertaking
3. Content of final Report "A" Study Plan For Technical Work, Outreach And Consultation
4. Content of final Report "B": Working Paper – Overview of Transportation, Land Use and Economic Conditions Within the Analysis Area
5. Content of final Report "C": Working Paper – 'Area Transportation System' Problems and Opportunities
6. Content of final Report "D": Working Paper – Area Transportation System Alternatives
7. Content of final Report "E": Milestone Report – Highway 7&8 Transportation Corridor Needs Assessment
8. Content of final Report "F": Working Paper - Environmental Conditions And Constraints
9. Content of final Report "G": Working Paper – Generation of Detailed Planning Alternatives for Provincial Roadway
10. Content of final Report "H": Milestone Report - Selection of Detailed Planning Alternatives for Provincial Roadway
11. Content of final Report "I": Working Paper - Generation of Provincial Roadway Preliminary Design Alternatives
12. Content of final Report "J": Milestone Report - Selection of Preliminary/Concept Design Alternatives for Provincial Roadway
13. Environmental Synopsis
14. Results of Outreach and Consultation
15. Commitments to Future Work and Consultation

The Transportation Environmental Study Report will be prepared at completion of the study and made available on the public record for a 60-day review period. If no Part 2 Order or "bump-up" requests are received by the Minister of the Environment by the completion of the review period (see Section 2.1 for details), the project would be deemed to have environmental clearance, and the Highway 7&8 Transportation Corridor Planning and Class EA Study would be completed.

As indicated in Section 1.1, decisions on funding and timing of construction are based upon environmental clearance of the TESR, since it determines the type of transportation facility and its location.

5.0 SUMMARY OF INPUT RECEIVED ON PREFERRED PRELIMINARY DESIGN ALTERNATIVE AND MTO RESPONSES AND CHANGES

In the final copy of this document, this section will provide a summary of comments and input received on draft *Report J: Selection of Preliminary Design Alternatives for Provincial Roadways* during the public review period, as well as an explanation of how this feedback was addressed in the updated version of the report.